

WHAT IS CLAIMED IS:

1. A method for generating a nucleic acid molecule with precise user control, the method comprising:

- a) providing a plurality of nucleic acids immobilized on a surface;
- b) providing a nucleic acid molecule attached to a protecting group;
- c) contacting said immobilized nucleic acid molecule with said nucleic acid molecule attached to a protecting group;
- d) elongating said immobilized nucleic acid molecule; and
- e) dissociating said immobilized nucleic acid molecule from said protecting group thereby extending said immobilized nucleic acid molecule.

2. The method of Claim 1, wherein said protecting group comprises proteins, carbohydrates; diphosphates, phosphate derivatives, nucleotides, oligonucleotides, or combinations thereof.

3. The method of Claim 1, wherein the removal of said protecting group is accomplished by the application of heat, proteases, phosphatases, restriction enzymes, or combinations thereof.

4. A method for removing or controlling errors in nucleic acid molecules comprising arbitrary user-specified sequence composition and length, the method comprising:

- a) providing a solid support for synthesis of nucleic acid;
- b) synthesizing nucleic acid attached to the solid support;
- c) passing the solid support and newly synthesized nucleic acid through a channel opening;

d) detecting errors in nucleic acid synthesis; and

e) correcting errors in nucleic acid synthesis.

5. A method for removing or controlling errors in nucleic acid molecules comprising arbitrary user-specified sequence composition and length, the method comprising:

a) synthesizing nucleic acids with 5' protecting groups;

b) monitoring the deprotection of the 5' protecting group using a channel opening;

c) detecting errors in nucleic acid synthesis; and

d) correcting errors in nucleic acid synthesis.

6. A method for detecting the addition of nucleotides to nucleic acid molecules comprising:

a) providing a solid support for the attachment of a nucleic acid;

b) elongating said attached nucleic acid;

c) detecting the force exerted on the growing nucleic acid molecule;

d) detecting errors in nucleic acid synthesis; and

e) correcting errors in nucleic acid synthesis.

7. A method for removing or controlling errors in nucleic acid molecules comprising arbitrary user-specified sequence composition and length, the method comprising the parallelization of single-molecule systems with and without arrays of light sources and detectors.

8. A method for the microfabrication of quadrupole arrays, the method comprising:

a) defining bond pads and lithographically defining and depositing a layer of diagonal metal wires on a silicon substrate;

b) lithographically designing and depositing a film of soft magnetic material over a portion of the metal lines; and

c) lithographically defining and depositing a second layer of metal lines over the magnetic film layer.

9. A method for independently controlling particles, the method comprising controlling said particles via an electric field, a magnetic field, optical tweezers, or any combinations thereof.

10. A method for synthesizing polymers in which individual molecules are monitored during synthesis to observe and evaluate the reaction products.